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Examining the classroom teaching of beginning physical science teachers who graduated from a topic specific pedagogical content knowledge based undergraduate programme

Miheso, Josephat Machina

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ABSTRACT

In science education, Topic Specific Pedagogical Content Knowledge (TSPCK) is attested to as a valid theoretical construct for implementation within topics in initial teacher preparation programs (Abell, 2008; Mavhunga, 2015). This study investigated the advantage brought about by the early exposure of Graduate Beginning Teachers of physical sciences, (intervention GBTs) to explicit TSPCK development at the time of their pre-service training in the quality of their classroom teaching. The study employed a qualitative comparative case study design of 7 intervention GBTs. A control sample of 3 GBTs, and 1 expert teacher were added to this sample. Data was collected and analyzed at four sampling stages. The first stage entailed fresh analysis of sets of data that were retrospectively collected from archived completed pre-versus-post TSPCK tools, which were used to measure the quality of planned TSPCK in the topics of intervention before and immediately after the intervention. The second stage comprised analysis of sets of freshly completed TSPCK tools in the same topics of intervention administered 2 years into the actual teaching practice of the intervention GBTs. The third stage involved a comparison of the freshly completed TSPCK test tools in the same topics of intervention and in new topics, collected from a sub-set sample of 3 intervention-GBTs vs. 3 control GBTs and 1 expert teacher. The new topics were different from those used during the intervention. The fourth stage included analysis of sets video-recorded lessons and pre- (post) lesson interviews, captured during the actual classroom teaching of the same sub-set of 3 GBT cohort pairs and the expert teacher. The completed TSPCK tools were analyzed and scored using the criterion based Mavhunga & Rollnick TSPCK (2013) rubric for scoring planned TSPCK. Measurement of the quality of enacted classroom teaching involved qualitative in-depth analysis for TSPCK episodes contained in the recorded lessons. This was followed by matching the identified episodes into pre-determined categories of quality in a newly developed and validated TSPCK classroom rubric, with assistance of three independent raters. The inter-rater reliability agreement in both planned and enacted TSPCK was calculated at a Cohen Kappa value of 0.80 and 0.822, respectively. The findings from the first and second sets of data confirmed a positive gain in the quality planned TSPCK at the end of the final year of the intervention GBTs training program and retention of the acquired quality two years into actual teaching practice. Findings from the third and fourth sets of data revealed that; the intervention-GBTs displayed added advantage over their control GBTs in planning and reasoning about teaching, as well as their real classroom teaching.

The above findings suggests that an early exposure to explicit TSPCK as part of teacher preparation may influence the retention of the aquired competency for planning and enactment of TSPCK across different topics in real classroom teaching among beginning physical science teachers. I acknowledge the small sample size used as a limitation to the generalization of the research findings. I however suggest that emphasis be placed on the displayed patterns, as they emerged from multiple qualitative data sources and recommend for the development of PCK in core science topics in pre-service teacher preparation programmes

Key words: Retention, Pedagogical Content Knowledge, Topic specific Pedagogical Content Knowledge; Pedagogical Transformation Competence